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SU(N) Clebsch-Gordan coefficients and non-Abelian symmetries
ARNE ALEX, LUKAS EVERDING, Arnold Sommerfeld Center, LMU Munich, PETER LITTELMANN, University of Cologne, JAN VON DELFT, Arnold Sommerfeld Center, LMU Munich — The numerical treatment of models with SU(N) benefits greatly from the Wigner-Eckart theorem. Its application requires the explicit knowledge of the Clebsch-Gordan coefficients (CGCs) of the group SU(N). We present an algorithm for the explicit numerical calculation of SU(N) CGCs based on the *Gelfand-Tsetlin pattern* calculus. Further exploitation of the Weyl symmetry of SU(N) irreducible representations (irreps) leads to a significant speed-up compared to our previous algorithm (J. Math. Phys. 52, 023507, 2011). Our algorithm works for arbitrary N and tensor products of two arbitrary SU(N) irreps. It is well-suited for numerical implementation; we provide a well-tested computer code for download and online use. Possible applications of our code include numerical treatments of quantum many-body systems using the numerical renormalization group (NRG), the density matrix renormalization group (DMRG), and general tensor network methods.

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